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Cost of producing apples in the Okanagan and average yields and prices for leading varieties ...

by W.A. Middleton

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Cost of Producing Apples in the  
Okanagan *and* Average Yields and  
Prices for Leading Varieties

AGRICULTURAL DEPARTMENT CIRCULAR No. 38

*By*

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*The report as submitted is based on a preliminary survey which it is planned to extend to other farms and districts during the coming years. The conclusions on one year's operations are consequently tentative.*

## PART I.

# Cost of Producing Apples in the Okanagan.

### INTRODUCTION.

**D**URING the season of 1920 a study was made of the different operations entering into the cost of producing apples in the Okanagan Valley for the year 1919. While studying production costs records were also taken on yields and average prices received for leading varieties of apples grown in the valley. The investigation was conducted for the purpose of obtaining more definite and accurate knowledge of the cost of producing apples and the average yields obtained from leading varieties.

The object of this report is to give average costs of apple production; to encourage the grower to keep more accurate records of his orchard expenses, so that he may realize more fully what his different operations cost, where improvements can be made, and how production cost can be lowered; and to show also how some of the leading varieties compare with each other in yields.

The data contained in this report were obtained directly from growers who were able to give reliable information. The time and expense involved in interviewing a large number of growers made it impossible to get as many records as was desired.

Where a large number of farms are used the average for any one factor will be more accurate than the same factor taken from any individual record.

Over eighty growers were interviewed, of which forty-two were able to give reliable figures for part of their cost. Many of the growers interviewed kept no records and hence were not in a position to furnish definite data. On the other hand, some who had not kept records were able to give reliable information which they had gained through their broad experience in orchard-work. The data received from such growers tallied closely with those who had kept accounts.

All figures on costs, yields, and prices in this report are average figures and relate to no one particular orchard. They represent the average cost of producing apples during the year 1919 and the average yield for seven leading varieties taken from 1913 to 1920, with the majority of records from the year 1919. The orchards from which the records were obtained are located in the fruit areas of Vernon, Kelowna, Summerland, and Penticton.

To give each orchard the same weight in the averages the acre was adopted as a suitable unit. The average size of the orchards studied was 16.2 acres. The average number of trees per acre was 74 and the average age of the trees 10 years. The several factors considered in obtaining data were: Cost per acre; cost per tree; yield per acre; yield per tree; profit per acre; profit per tree.

### PLAN OF THE WORK.

A questionnaire form was made out and presented to each grower interviewed. This form consisted of questions covering all growing, handling, and overhead costs, also yields and prices. Growers were asked to go over the questionnaire carefully and answer all questions upon which they could give reliable data. Later, these same orchardists were again interviewed and as much additional information as possible was received from each grower. In very few cases could any one grower answer all the questions, but by interviewing a large number it was possible to get figures on all questions, from which a final and satisfactory average was obtained.

### KEEPING ORCHARD RECORDS.

Many growers have been and are still engaged in the growing of fruit without keeping an account of their expenses and returns. It cannot be said, however, that such growers are not successful in their business. Many have used good judgment in the choice of their orchard land and their equipment and in the management of

their farm, and so are to be considered successful growers. Others have entered the fruit business determined to keep accurate records of all operations carried out, but sooner or later the average grower has given the whole thing up in despair after realizing the amount of work entailed in carrying on such accounts. He has gone from one extreme to the other, his final plan being to keep no records at all and thus be relieved of the time and worry involved in keeping such elaborate accounts. Of course, records are kept on nearly all of the large orchards, but it is seldom done on the smaller farms where the grower himself does most of the work.

Most growers are willing enough to keep accounts, provided that in so doing the work is not too complicated and does not take up too much time. Even though the importance to every grower of knowing as much as possible about his business is admitted, it is surprising how little some do actually know. One should be able to tell fairly accurately what his different operations cost him each year in the growing and handling of his crop. He should know, also, the yield from the different varieties and the price received for each, if a fair comparison between varieties is to be made. To do this accurately, yearly yield records should be kept, not merely on the orchard, but also on the basis of variety; the number of trees and the age of each variety being known. At the end of each year the grower should then be able to make a brief summary of the year's work and know just how much he has made or lost, where his heavy expenses occurred, and the comparative net returns from the different varieties.

It will be found interesting and in many cases surprising to learn where the heavy expenses occur and the net returns the different varieties are making.

#### COST OF PRODUCTION.

In working out the cost of producing apples the following items were considered, viz.: The cost of all operations involved in growing and handling the fruit; the cost of materials used; the value of orchard land and the value of equipment.

No extra charge has been made for the owner's time, he being allowed the average wage paid for farm-labour. Although in this report no extra charge has been made, the writer feels that normally the owner should be allowed higher wages for his managerial work.

In discussing the costs of the different operations entering into the cost of production, the number of records received for each operation is noted under each heading. For instance, under pruning 22 growers were able to give figures on their pruning costs, while under irrigation-labour costs 27 growers were able to give reliable figures.

#### VALUE OF ORCHARD LAND.

The price of fruit land in the Okanagan is high, as is shown in the figures dealing with cost of production (Table 2). The reason for land values being high is accounted for not altogether by the average returns received from the crop, but to some extent is influenced by the desirability of the valley as a place in which to live. The buyer pays for the location, scenery, and climate, as well as for the commercial value. In other words, there is a sentimental value placed on the land. The returns from some orchards, however, have justified the high price asked for the land.

To arrive at the correct commercial value of the orchard the original cost of the land together with the annual expenditure and receipts must be considered.

The average price asked for good bearing orchards from 9 to 10 years of age in 1919 was \$1,091.50 per acre. With the interest charge on investment figured at 8 per cent., the interest charge per acre is \$87.32, which, as will be seen, is 38.64 per cent. of the total cost of production (Table 2).

#### LABOUR.

Labour is one of the troublesome problems the grower has to contend with where hired help is necessary, as is the case on most farms. The cost of production is generally increased if the grower has to hire unskilled labour. It is poor economy

to hire a poor worker even though less wages are paid. One good man is better than two poor men. However, the scarcity of labour that existed in 1919 left the grower little choice in this matter, as he generally had to hire whomsoever he could get.

Labour is a big factor in cost of production. The total of all labour costs represents 46.7 per cent. of the total cost of production (Table 2).

The average wage paid for farm-labour in 1919 was \$3.57 per day, and the average wage paid for one man and team was \$8.25. These figures are used throughout the report in arriving at all labour costs, with the exception of labour for pruning, which, requiring more skill than the other orchard operations, is charged at \$3.80 per day.

#### GROWING AND HANDLING COSTS.

Under this heading the labour costs for all operations necessary in the growing and handling of the fruit-crop are considered.

*Manuring (27 Records).*—The majority of fruit-growers in the Okanagan do not keep much stock; consequently the amount of manure produced on the farm is small. Where manure is available, generally only a portion of the orchard is manured each year, the grower using only the manure produced on the farm. In a few orchards manure and commercial fertilizers have been bought and applied.

Recently more attention is being paid to cover-crops in the orchard. Many of the farms studied had part, and a few had all, of the orchard land under cover-crops.

The average labour cost for applying manure is \$3.34 per acre; the average amount of manure applied per acre being  $2\frac{1}{4}$  tons.

*Pruning (22 Records).*—Pruning is a general practice with all growers; the Okanagan orchards, on the whole, being well pruned. The average number of trees pruned per day of 8 hours is 20, and the average wage paid for pruning is \$3.80 per day. The cost of pruning per acre is \$14.06, which, on a basis of 74 trees to the acre, would give a pruning cost per tree of 19 cents. These figures are for trees 8 to 12 years of age, the average being 10 years.

*Disposal of Prunings (22 Records).*—The general method followed in disposing of the prunings is to gather the brush, haul to a pile, and burn. Two men and a team are used for this work. The average cost is \$3.40 per acre on the basis of 74 trees to the acre.

#### CULTIVATION.

*Ploughing (30 Records).*—The majority of growers plough part of their orchard once a year, a few plough twice, while others omit ploughing altogether and depend on the disk and harrow for cultivation. Thus the average cost of ploughing appears to be below what it would actually cost to plough an acre of orchard land. The average cost per acre for ploughing is \$4.71.

*Disking (29 Records).*—From figures received it was found that 9 growers omitted disking; 7 disked once; 2 twice; 2 three times; 1 four times; 2 five times; and 1 ten times. The average number of times disked was 1.8. The average cost for disking per acre is \$3.19.

*Harrowing (29 Records).*—It was found that 2 growers omitted harrowing; 1 harrowed once; 3 harrowed three times; 3 four times; 4 five times; 3 six times; 4 eight times; 6 ten times; and 3 twelve times. The average cost of harrowing per acre is \$5.93.

*Irrigation (27 Records).*—The cost of irrigating varies a great deal according to the lay of the land, conditions of the soil, arrangement of ditches, and the amount of available water.

The open ditch is the common method used for the conveyance of water, although flumes and underground pipe-lines are being built more and more each year. The initial cost of installing pipes is expensive, but will probably prove the cheapest in the long run.

On the average, three irrigations are applied during the season. In arriving at the labour costs of irrigating, the marking-out of ditches with a team of horses was

taken into consideration, as well as the time spent in looking after the water. The average labour cost per acre under various methods employed is \$8.54.

*Thinning of Fruit (14 Records).*—Only 14 growers were able to give reliable figures on thinning. It should be borne in mind that the cost of thinning varies according to the variety grown, the set of fruit, and the skill of the operator. The cost of thinning naturally runs high during years of heavy yields. It would appear from some of the orchards studied that the thinning costs are too high, while, on the other hand, some orchards show a very low cost, which would suggest that not enough thinning was practised.

Some growers are under the impression that it does not pay to thin, while others are strong advocates of heavy thinning. The grower should study the bearing habits of his different varieties and thin accordingly; enough space being allowed each apple for proper development. Such varieties as the Duchess, Wagener, and wealthy often require a great deal of thinning. The McIntosh, on the other hand, has a tendency to set too heavily, but will thin itself to a large extent and still produce a heavy crop of high-grade apples. The average cost of thinning per acre for the year 1919 was \$22.74 or 30.7 cents per tree, figured on 74 trees per acre.

*Propping of Trees (27 Records).*—Propping is not a general practice in the valley, although most growers do a certain amount in years of heavy yields. It is a practice that should receive more attention, especially where the trees have been poorly pruned. Broken limbs that are occasionally seen on heavily laden trees often might have been saved by propping. The general method of propping fruit-trees is by using sticks. The average cost for propping is \$2.21 per acre.

*Spraying (20 Records).*—Fortunately the fruit-growers in the Okanagan have not had to contend with many of the troublesome fruit pests that are so common and destructive in the majority of the fruit-growing sections outside the Province. Nevertheless, there are certain fruit insects and diseases to combat and generally some spraying must be done.

The majority of the growers interviewed with regard to their spraying costs used power-sprayers, the work being done with a team and three men, or in some cases two men. The cost of spraying will likely increase in the future, as more spraying will have to be done to destroy pests already present in the valley and to prevent the spread of new insects and diseases which are bound to creep in. The average labour cost for spraying amounts to \$4.92 per acre. Figuring 74 trees to the acre, the cost per tree is 6.65 cents.

*Miscellaneous (17 Records).*—There are always a good many odd jobs to be done in the orchard, such as hoeing, summer pruning, etc., that are hard to keep track of, and difficulty was experienced in getting reliable figures on this work. Seventeen growers were able to give records on this cost, and when averaged it was found that the cost per acre was \$4.02. At 74 trees to the acre, the cost per tree is 5.43 cents.

*Picking (34 Records).*—Several factors influenced the cost of picking, such as the age of the tree, the size of the tree, the size of the fruit, and the variety. The cost of picking, therefore, varies a great deal in the different orchards. In the young orchard this cost is much less than in the older ones where the trees are of large size, necessitating the use of high ladders. Lightness of ladders and convenient picking-pails have considerable influence on the cost of picking. It was found that the number of orchard-boxes picked per day varied from 35 to 100 from records taken from orchards where the trees ranged in age from 6 to 15 years, the average age being 10 years. The average number of boxes of apples picked per day of 10 hours is 61.8, which, at the average wage of 3.57 per day, gives a picking cost of 5.77 cents per box. With the average yield for leading varieties in 1919 at 280 boxes, the cost per acre for picking is \$16.156 (practically \$16.16), and the cost per tree 21.83 cents.

*Hauling (27 Records).*—Under this heading is included the cost of hauling empty orchard-boxes from the central packing-house to the orchard, and hauling the filled boxes from the orchard to the packing-house. The general practice is for the grower

to haul his own fruit. In the southern end of the valley, where the fruit-farms average smaller in size than those at the northern end, a good many of the growers have their hauling done by contract. The growers handle the boxes from the main road into their orchard, and the filled boxes from the orchard to the loading-place on the main road, where they are then picked up by the contractor and conveyed to the central packing-house.

The average hauling distance (27 records) is 2.9 miles, and the average cost per box to haul both ways, and including the transportation of boxes within the orchard, is 4.38 cents per box, which, with a yield of 280 boxes of fruit to the acre, gives a cost per acre for hauling of \$12.26.

#### TOTAL LABOUR COSTS.

With a few exceptions, the fruit-growers in the Okanagan do not pack their own fruit; the handling of the fruit after it is delivered at the packing-house rests with the shipper. Table 1 shows the total labour costs borne by the grower.

TABLE 1.—TOTAL COSTS.

Item.	Cost per Acre.	Cost per Tree.	Per Cent.
Manuring .....	\$ 3 34	\$0 045	3.15
Pruning .....	14 06	19	13.32
Disposal of prunings .....	3 40	046	3.40
Ploughing .....	4 71	0637	4.46
Disking .....	3 19	0436	3.02
Harrowing .....	5 93	08	5.61
Irrigating .....	8 54	1154	8.09
Thinning .....	22 74	307	21.46
Propping .....	2 21	03	2.09
Spraying .....	4 92	0665	4.66
Miscellaneous .....	4 02	0543	3.81
Picking .....	16 16	2183	15.31
Hauling .....	12 26	1657	11.62
Totals .....	\$105 48	\$1 4255	100.00

The total labour cost being \$105.48 per acre (Table 1), the labour cost per box of fruit would be 37.67 cents on a yield of 280 boxes per acre. From this it is evident that the grower would have to receive over 37 cents per box for his apples to pay for labour costs alone.

#### MATERIAL COSTS.

Apart from the labour cost, a charge is made each year for materials used, such as for fertilizing and spraying.

*Manure (23 Records).*—It was difficult to arrive at a fair figure on the amount of manure applied per acre in the orchards studied. The general practice followed is to haul the manure out from time to time as it accumulates in the barnyard, most of the manure being applied during the winter and spring. The average grower does not pay enough attention to the proper care and handling of manure, which results in considerable loss in fertilizing value. The average amount of manure applied per acre is  $2\frac{1}{4}$  tons and the average price per ton is \$3.43. The cost per acre therefore amounts to \$7.78.

*Spray Material (20 Records).*—Lime-sulphur solution is the spray generally used. Nicotine sulphate, arsenate of lead, and whale-oil soap are used to some extent also. Due to the comparative freedom from insect pests and diseases in the Okanagan, the grower is saved considerable money on spray material; the cost, however, is increasing, as more spraying is being practised every year. The cost of spray material is \$3.74 per acre, or 5 cents per tree at 74 trees per acre. This cost includes the various sprays used.

### FIXED COSTS.

Under fixed costs are considered water-rent, taxes, investment in and depreciation on orchard equipment, also interest on investment in orchard land.

*Water-rent (28 Records).*—The charge for water varies in the different districts, due to the initial cost of supplying the water and the area supplied. The average charge per acre for irrigation-water is \$4.50; at 74 trees per acre the cost per tree is 6 cents.

*Taxes (27 Records).*—There is a considerable spread in the charge for taxes. The average tax for orchards studied is \$5.33 per acre.

*Orchard Equipment (27 Records).*—The average investment for orchard equipment amounts to \$59.39 per acre; the equipment includes all implements and working-horses used for orchard-work. The depreciation charge is figured at 12 per cent., and interest on money invested in equipment at 8 per cent. The total charge for depreciation and interest on equipment being 20 per cent., the cost per acre, therefore, is \$11.88.

*Interest on Investment (27 Records).*—Due to the high value of good orchard land in the Okanagan Valley, the interest on investment is one of the heavy charges against the orchard. At an average valuation of \$1,091.50 per acre, and with interest at 8 per cent., the charge for this item amounts to \$87.32 per acre.

### TOTAL COSTS.

Table 2 gives the total cost for labour, material, and fixed costs which enter into the cost of producing apples.

TABLE 2.—TOTAL COSTS.

Item.	Cost per Acre.	Cost per Tree.	Cost per Box.	Per Cent. of Total Cost.
<i>Labour.</i>				
Manuring .....	\$ 3 34	\$0 045	\$0 012	1.5
Pruning .....	14 06	19	0505	6.2
Disposal of prunings .....	3 40	046	012	1.5
Ploughing .....	4 71	0637	017	2.0
Disking .....	3 19	0436	0113	1.4
Harrowing .....	5 93	08	021	2.6
Irrigation .....	8 54	1154	0305	3.8
Thinning .....	22 74	307	0812	10.0
Propping .....	2 21	03	008	1.0
Spraying .....	4 92	0665	0175	2.2
Miscellaneous .....	4 02	0543	0143	1.8
Picking .....	16 16	2183	058	7.2
Hauling .....	12 20	1657	044	5.4
<i>Material.</i>				
Manure .....	7 78	105	028	3.4
Spray material .....	3 74	0505	0133	1.7
<i>Fixed.</i>				
Water-rent .....	4 50	0608	016	2.0
Taxes .....	5 33	0722	019	2.4
Equipment .....	11 88	1605	0417	5.3
Investment .....	87 32	1 18	312	38.6
Totals .....	\$226 03	\$3 0545	\$0 8073	100.0

Considering all costs, except packing-house charges, as found in Table 2, the total cost per acre is \$226.03. With a yield of 280 boxes to the acre the cost per box of fruit amounts to 80.73 cents per box. The grower must receive, then, over 80 cents per box on a yield of 280 boxes per acre to pay for his growing, handling, materials, and fixed costs.

**PACKING-HOUSE COSTS.**

In very few cases does the grower pack his own fruit. The fruit is practically all packed at local or central packing-houses. The average packing-house charge, which includes all labour such as making boxes, trucking, packing, sorting, nailing, labelling, and loading on cars, also material costs such as shooks for boxes, nails, paper and labels, and overhead charge, amounts to 55 cents per box. On an average yield of 280 boxes per acre the cost would be \$154, or, at 74 trees per acre, the cost per tree would be \$2.08.

Adding this packing-house cost to the total costs to be borne by the grower, the total charge against the orchard per acre would be \$380.03; against each tree \$5.135 (on a basis of 74 trees to the acre), and against each box, on a yield of 280 boxes per acre, the charge would be \$1.357. On this basis, therefore, in order to realize a profit on each box of apples f.o.b. the cars at shipping-point, the price per box would have to be over \$1.35.

**COSTS ON DIFFERENT YIELDS.**

From the above costs it is possible to determine the average cost of production on various yields. It will be observed that as the yield per acre decreases so does the production cost per acre decrease, but the cost per box increases. For instance, on a yield of 146 boxes per acre, omitting thinning and propping charges, as shown in Table 2, and reducing the picking and hauling costs to a basis of 146 boxes per acre, the cost per acre would be \$186.78 and the cost per box \$1.28. On a yield of 146 boxes to the acre the grower must receive over \$1.28 per box to pay for his total cost. Adding to this the packing-house charge of 55 cents per box, the total cost would be \$1.836 a box and the charge at shipping-point f.o.b. the cars would have to be over \$1.83 per box to realize a profit. On the other hand, if the yield per acre increases, the growing and handling costs per acre also increase, but the cost per box decreases and the profits per acre would be greater.

## PART II.

## Average Yields and Prices for Leading Varieties.

There were in bearing in the Okanagan Valley in 1919 about 12,000 acres of apples 5 years of age and over. The apple-crop in the valley for the same year amounted to practically 1,750,000 boxes, giving an average yield per acre of approximately 146 boxes. Considering only some of the best commercial varieties grown in the average orchards, the yield in 1919 amounted to practically 280 boxes per acre, or an increase of 134 boxes per acre over the actual yield.

Reducing this to a tree basis, at 74 trees to the acre, this would mean an average actual yield of 1.97 boxes per tree for all varieties; 3.78 boxes per tree for the better varieties, or an increase of 1.81 boxes per tree. On 12,000 acres this would mean an increase of 1,608,000 boxes of fruit. In other words, if the orchards in the Okanagan contained good commercial varieties the yield in 1919 would have amounted to approximately 3,358,000 boxes of apples. Figuring the average price paid to the grower in 1919 at \$1.35 per box, the extra money that would have been received by the Okanagan growers for that year would have amounted to about \$2,170,800.

In securing data on yields only those varieties which had proven suitable for the valley, and which have gained commercial importance, were considered. Other varieties have been omitted from this report for various reasons. There are, for instance, varieties such as the Canada Baldwin, St. Lawrence, and Ben Davis that have proved good yielders and suitable for the Okanagan, but for which the market is limited, since they are low-grade apples and do not bring top prices on the market when competing against such varieties as McIntosh, Rome Beauty, or Delicious. Other varieties grown in the valley, such as Spitzenberg, Spy, and Cox's Orange, are high-grade apples and bring good prices, but are not suitable for Okanagan conditions and therefore have not to be considered in this report.

Yields were secured from 42 different orchards, 12 of which were located in the Vernon District, 9 in the Kelowna, 5 in Summerland, and 16 in the Penticton District.

TABLE 3.—SHOWING NUMBER OF RECORDS ON YIELDS RECEIVED FOR THE YEARS 1913 TO 1920.

Variety.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	Total.
McIntosh .....	2	5	7	7	12	16	29	2	80
Rome Beauty .....	..	1	1	1	2	3	7	..	15
Delicious .....	..	..	..	1	1	3	10	1	16
Wealthy .....	1	2	4	4	7	7	15	1	41
Jonathan .....	3	5	7	8	10	14	23	3	73
Yellow Newtown .....	..	1	2	3	4	5	12	2	29
Wagener .....	..	2	2	3	5	8	15	1	36

It will be noted in the above table that the majority of records on yields were received for the year 1919. Since in general a heavy crop was produced in 1919 the total averages on yields may appear a little high. The main object, however, being to determine how the leading commercial varieties compare with each other in yields, this heavy 1919 crop will not materially affect the value of the comparison.

TABLE 4.—AVERAGE YIELD PER TREE, 5 TO 12 YEARS OF AGE.

Variety.	Age.	No. of Trees.	Total Yield in Pounds.	Average Yield in Pounds.
McIntosh	5	5,414	150,080	27.7
	6	4,745	87,774	18.5
	7	7,472	575,912	77.0
	8	4,934	480,455	97.0
	9	3,166	426,556	133.8
	10	2,966	593,054	199.9
	11	1,256	356,306	283.6
	12	1,092	493,045	451.5
Delicious	5	850	18,092	21.28
	6	697	14,720	21.1
	7	974	65,214	66.9
	8	370	24,600	66.5
	9	310	38,745	124.9
	10	375	56,399	150.4
	11*	....	....	....
	12*	....	....	....
Wealthy	5	4,346	85,500	19.9
	6	2,499	31,680	12.6
	7	5,449	358,614	65.9
	8	2,870	185,050	64.5
	9	3,402	473,762	139.2
	10	3,189	372,850	116.9
	11	675	144,488	214.0
	12	325	105,680	325.0
Rome Beauty	5	....	....	....
	6	100	3,600	36.0
	7	162	10,074	62.1
	8	180	8,274	45.9
	9	334	44,520	133.3
	10	243	49,940	205.5
	11	243	53,800	221.4
	12	88	17,560	199.5
Jonathan	5	13,982	169,000	12.0
	6	12,099	267,204	22.0
	7	15,712	1,296,357	82.3
	8	6,171	405,229	58.6
	9	7,372	727,078	98.6
	10	7,287	572,514	78.5
	11	4,062	505,560	124.4
	12	1,850	378,051	204.3
Yellow Newtown	5	838	Nil	Nil
	6	1,022	14,720	14.4
	7	1,298	18,892	14.5
	8	1,122	27,960	24.9
	9	640	81,725	127.7
	10	358	36,392	101.6
	11	193	25,560	132.4
	12	195	42,920	220.0
Wagener	5	2,936	84,960	28.9
	6	1,140	12,570	11.0
	7	4,280	159,848	37.3
	8	3,485	195,049	55.9
	9	2,176	117,640	54.9
	10	3,086	238,617	77.3
	11	2,144	213,960	99.3
	12	1,270	274,750	216.3

\* No records.

Table 4 shows the number of trees at different ages in which yields were received. It will be noted that the number of trees recorded from Rome Beauty and Delicious are small compared with the other varieties. Records taken from a larger number of trees might have affected the average to some extent.

A brief study of this table will show that in nearly all cases the 5-year-old tree gives a higher average yield than the 6-year-old. This is accounted for by the alternate bearing of the fruit-trees. To make a fair comparison on yields of different varieties it is obvious that yields for a number of years must be taken.

TABLE 5.—AVERAGE YEARLY YIELD PER TREE, 5 TO 10 YEARS OF AGE, 6-YEAR PERIOD.

Variety.	Yield in Pounds.	Yield in Boxes (40 Lb.).
McIntosh . . . . .	92.4	2.31
Rome Beauty . . . . .	80.5	2.01
Delicious . . . . .	75.18	1.88
Wealthy . . . . .	69.8	1.73
Jonathan . . . . .	58.7	1.47
Yellow Newtown . . . . .	47.2	1.18
Wagener . . . . .	44.2	1.10

TABLE 6.—AVERAGE YEARLY YIELD PER TREE, 6 TO 12 YEARS OF AGE, 7-YEAR PERIOD.

Variety.	Yield in Pounds.	Yield in Boxes (40 Lb.).
McIntosh . . . . .	180.2	4.5
Wealthy . . . . .	134.1	3.35
Rome Beauty . . . . .	129.1	3.2
Jonathan . . . . .	95.5	2.4
Yellow Newtown . . . . .	90.78	2.27
Wagener . . . . .	78.9	1.97

No records were received on Delicious trees 11 and 12 years of age; consequently this variety is not included in Table 6.

TABLE 7.

Variety.	Average Yield per Tree, 5 to 10 Years, in Boxes.	Average Price per Box, 1919, Nos. 1 and 2.	Average Returns per Year.
Delicious . . . . .	1.88	\$1 85	\$3 48
McIntosh . . . . .	2.31	1 46	3 37
Rome Beauty . . . . .	2.01	1 37	2 75
Wealthy . . . . .	1.75	1 36	2 38
Jonathan . . . . .	1.47	1 34	1 96
Yellow Newtown . . . . .	1.18	1 39	1 54
Wagener . . . . .	1.10	1 30	1 43

TABLE 8.

Variety.	Average Yield per Tree, 6 to 12 Years, in Boxes.	Average Price per Box, 1919, Nos. 1 and 2.	Average Returns per Year.
McIntosh . . . . .	4.5	\$1 46	\$6 57
Wealthy . . . . .	3.35	1 36	4 54
Rome Beauty . . . . .	3.2	1 37	4 38
Jonathan . . . . .	2.41	1 34	3 22
Yellow Newtown . . . . .	2.27	1 39	3 16
Wagener . . . . .	1.97	1 30	2 56

A brief study of Tables 7 and 8 will show that the McIntosh is the heaviest-producing variety, but in Table 7 it will be noted that the Delicious has given a greater return per tree, even though the yield is lower, due to the extra price this apple brings on the market.

#### VARIETIES.

The planting of unsuitable varieties has cost growers in the Okanagan thousands of dollars. This mistake, however, could hardly have been avoided, as the pioneer growers were naturally inclined to plant those which had proven successful in the Old Country, Eastern Canada, or the United States, thinking they would be equally well or better in the Okanagan. Results, however, have shown that a good many varieties that have been planted have not proven suitable to Okanagan conditions. There have been a few instances also where nurserymen have shipped trees not true to name or have substituted wrong varieties, with the result that the grower found, after his trees began to bear, that instead of McIntosh, which he had ordered, he had Baldwins or some other unsuitable variety.

More attention is now being paid to the successful commercial varieties, so that the number of undesirable sorts is gradually decreasing. Those who have unsuitable varieties should seriously and intelligently consider if it would be to their advantage to top-work their trees to good varieties, or to pull out their unprofitable trees and plant a young orchard, or, if the fault lies with the soil and location, to grow some other crop which would be reasonably sure to give better returns than the orchard.

For a good commercial orchard the individual grower should guard against the planting of too many varieties, and, on the other hand, the grower may make the mistake of confining his plantings to but one or two varieties. A safe rule to follow would be to plant not less than three or not more than six different varieties. Four will be sufficient in most cases. By choosing the varieties that ripen at different seasons one may extend the picking period, which is an important factor to consider in harvesting a fruit-crop.

#### VARIETIES RECOMMENDED.

While studying orchard costs and yields an effort was made to determine which varieties were most suitable for the Okanagan, both from a grower's and a shipper's point of view. Only varieties which appear to be suitable for the valley and have been well received on the market were considered. It is not unlikely that other varieties will be recommended later, but as yet they have not been sufficiently tested out to warrant approval for commercial planting at this time.

In recommending commercial varieties for planting in the Okanagan the valley has been separated into two divisions. The northern half includes Kelowna and the fruit districts north; the southern half includes the fruit districts south of Kelowna.

*Division 1 (Kelowna and North).*—McIntosh, Delicious, Rome Beauty, Wealthy, and Duchess.

*Division 2 (South of Kelowna).*—Delicious, Rome Beauty, Winesap, Stayman, Jonathan, and Gravenstein.

*McIntosh.*—Undoubtedly the McIntosh is one of the leading varieties grown in the Okanagan. It appears to be more particularly adapted, however, to the northern end of the valley, bearing more regularly each year than in the southern districts. The shipping quality of the northern-grown McIntosh also surpasses that of those grown in the south end of the valley.

The McIntosh comes into bearing early, is a fast-growing tree, and a heavy yielder, standing head and shoulders above other varieties in this respect.

The McIntosh will largely thin its fruit on the tree and still produce a heavy crop of No. 1 apples. Nevertheless, thinning should be practised for best results.

One of the main objections to this variety is that it has a comparatively short harvest season and will drop easily when it has reached maturity.

Many growers are under the impression that the planting of the McIntosh has been, or will soon be, overdone in British Columbia. It is a variety that must be

handled and consumed in a comparatively short season, practically two months, October and November, although with proper care one may enjoy the McIntosh until the New Year and even later. Also this variety is now being planted largely in the East. To offset these facts, on the other hand, one must remember that the McIntosh reaches its perfection in British Columbia and the Province should be able to more than hold its own with this variety.

*Delicious.*—Much attention has been paid to the Delicious during recent years, and prices received for this variety have topped those received for all other varieties, except on the Old Country market.

The Delicious has proven very well suited for the Okanagan and, as shown in Table 7, has given a greater return per tree to the grower than any other variety. The fruit is evenly distributed over the tree and heavy thinning is not necessary as a rule. The Delicious may be considered the leading late variety grown in the Okanagan.

*Rome Beauty.*—This variety has gained in popularity in late years. It is now considered one of the best baking-apples on the market. The Rome Beauty has proven to be well adapted for Okanagan conditions and will be favourably considered in future plantings. More data are required to strike what would be considered a good average yield for this variety, although it is not likely that further records would alter materially the yield as shown in Tables 5 and 6.

*Wealthy.*—The Wealthy is a hardy tree and does exceptionally well in the Okanagan, especially in the northern section of the valley. It has a tendency towards alternate bearing, over-bearing one year and producing a light crop the following year. During heavy-bearing years considerable thinning must be practised, as the apples will bunch and will not thin themselves so readily as do the McIntosh.

*Duchess.*—The Duchess is the leading variety grown in the northern end of the Okanagan, its season being just ahead of the Wealthy. Unfortunately, sufficient records were not received to give a fair average on yield.

This variety, like the Wealthy, has a tendency to bear fruit in bunches and thinning must be practised. The Duchess is a comparatively small-growing tree and should be considered chiefly as a filler.

*Winesap.*—Extensive planting of the Winesap will probably be made in the southern end in the Okanagan, especially in the Osoyoos and Similkameen sections. It does fairly well in the Penticton District, but farther north than this the fruit does not, on the average, develop the desired size.

The market demand for the Winesap is good, and this variety will undoubtedly reach commercial importance in the future in fruit districts south of Penticton. The records so far received on yields for this variety are not sufficient to strike a reliable average.

*Stayman.*—This variety has not yet reached commercial importance in the valley. It appears, however, to be well adapted for the Summerland and Penticton Districts, and will undoubtedly be given favourable consideration in future plantings.

The Stayman does not equal its parent, the Winesap, in colour, although in the south end of the Okanagan it colours well and makes quite an attractive apple when packed, and is in good demand on the market. The tree comes into bearing young and is a reliable cropper. Due to the limited plantings of this variety, sufficient records were not received on yields to obtain a good average.

*Gravenstein.*—More attention is being paid to the Gravenstein in the Summerland and Penticton sections, and although no yield records were obtained, it would appear that the Gravenstein may become one of the leading fall apples in the sections above mentioned, and possibly in the Osoyoos country as well.

Due to its high quality, the Gravenstein is in good demand on the market and will generally bring a comparatively high price. The planting of this variety will be limited for some time until it is more thoroughly tested out.

*Jonathan*.—This is one of the leading varieties now grown in the Okanagan. It is better suited for the southern end of the valley and future plantings will be chiefly confined to the Osoyoos and Similkameen Districts, and there only as a filler. The Jonathan has not proven a very hardy tree and is subject to winter injury except in favoured localities. This variety is well received on the market.

*Wagener*.—As shown in Tables 5 and 6, the Wagener is not a heavy yielder; this, of course, is to be expected as the Wagener is a small-growing tree. The tree is not particularly hardy and during extreme cold weather it is subject to winter injury, but fortunately appears to be able to make a quick recovery.

In favoured locations the Wagener does well, but future plantings will be limited, as it can only be considered as a filler and is not a strongly favoured apple on the market.

*Yellow Newtown*.—The market demand for the Newtown is generally good, especially in the Old Country, but this variety has not proven a heavy yielder, as will be noted in Tables 5 and 6, and is not recommended for future planting.

#### SUMMARY.

The information contained in this report is the result of one season's work. More definite and conclusive results could be obtained by averaging records from a larger number of farms and extending the work over a series of years.

On a basis of 74 trees to the acre at an average of 10 years, and giving an average yield of 280 boxes of fruit per acre, the total cost (not including packing-house charges) of producing apples in the Okanagan in 1919 was \$226.03 per acre; \$3.0545 per tree; 80.73 cents per box. (Table 2.)

The total labour cost amounts to \$105.48 per acre; \$1.4255 per tree; 37.67 cents per box; a total of 46.7 per cent. of the total cost of production. (Tables 1 and 2.)

The total material cost amounts to \$11.52 per acre; 15.56 cents per tree; 4.12 cents per box; a total of 5.1 per cent. of the total production cost. (Table 2.)

The total fixed cost amounts to \$109.03 per acre; \$1.4734 per tree; 38.94 cents per box; a total of 48.2 per cent. of the total production cost. (Table 2.)

As the yield per acre increases the growing and handling costs also increase, but the cost per box decreases.

Good commercial varieties suitable for Okanagan conditions averaged 280 boxes per acre in 1919. The average for all varieties for the same year was 146 boxes per acre.

Apple varieties vary considerably in yield, averages, and selling-price. (Tables 7 and 8.)

Many varieties now grown are unsuitable to Okanagan conditions. The elimination of poor varieties by top-working to good varieties, or by pulling out the trees and planting suitable varieties, should be considered.

Four varieties, each maturing at different seasons, will on the average be sufficient for one orchardist to plant.

Certain good commercial varieties have proven more suitable for the northern end of the Okanagan than the southern end, and vice versa.

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